



NASA STTR 2017 Phase I Solicitation

T12.02 Technologies to Enable Novel Composite Repair Methods

Lead Center: KSC

Participating Center(s): JSC, MSFC

Technology Area: TA12 Materials, Structures, Mechanical Systems and Manufacturing

As composite structures become more prevalent on launch vehicles, it will become necessary to have the capability to inspect and repair these structures during ground processing prior to launch. Current composite repair methods developed for the aviation industry are time consuming and require complex infrastructure in order to restore the structural strength. Aerospace structures have structural and thermal profiles which are different than aircraft and require different considerations; for example, unlike a commercial aircraft, a launch vehicle sees high loading but is only a one time use vehicle. Advancements are needed to repair materials and methods which allow for a structural repair to be performed in locations with minimal access and in a short time frame. Small damages may be accepted by analysis with no repair. Large damages may require extensive repair or component replacement. This subtopic focuses on developing novel composite repair methods for damages that fall in between these two categories. These novel materials and methods should consider the following:

- Use of out of autoclave composite materials and processes, which are being investigated for large launch vehicle components, such as fairings, skirts and tanks on the Space Launch System vehicle. Advancements in these material systems has begun to approach properties of autoclave materials but allow for larger structures to be fabricated.
- Simplified preparation of the damaged structure. Current methods require very precise methods, which is time consuming and can be a risk for further damage.
- Material systems and methods which reduce or eliminate the need for external heat and/or vacuum. These require complex infrastructure, which can be difficult to accommodate at the launch pad, and can be time consuming, which could cause a launch delay.
- Ability to acquire data on the state of the repair, during repair and/or during the launch. This may include data such as temperature at the bondline during cure, strain across the repair patch, etc.

Development of a material system and repair method which increases the performance of the repair and reduces the complexity and time required to perform a repair increases the launch capability and success rate. Improvements or modifications to current materials and processes can be made to meet NASA requirements. This technology can also be expanded to develop methods for in-situ repairs to spacecraft on long missions.